Green River Flood Control Zone District
2002 Annual Report






King County
Department of Natural Resources and Parks
Water and Land Resources Division
Flood Hazard Reduction Services Section

Green River
Flood Control Zone District
Serving Auburn, Kent, Renton,
Tukwila, and King County

TABLE OF CONTENTS

INTRODUCTION AND BACKGROUND

The purpose of this annual report is to provide an accounting of 2002 Green River Flood Control Zone District's (District) revenue, expenditures and work program accomplishments. An annual reporting of District revenues and expenditures is required in the Green River Basin Program Interlocal Agreement (ILA), adopted June 30, 1992 adopted by King County and the Green River Valley cities of Auburn, Kent, Renton and Tukwila. This report also provides a summary of the annual maintenance and repair activities made to the District's flood protection facilities in 2002.

In 1978, King County and the Green River Valley cities signed an interlocal agreement to form the Green River Basin Program, which supported a more comprehensive and programmatic interjurisdictional flood control and drainage program for the lower Green River Basin. In 1985 and 1992, the Green River Basin Program interlocal agreement was extended with concurrence from King County and the cities of Auburn, Kent, Renton and Tukwila to further support each jurisdiction's shared interest for coordinating flood hazard planning, coordination and implementation.

In 2002, a new contemporary interlocal agreement renewed the principles embodied in the 1978, 1985 and 1992 interlocal agreements for a ten-year period. The *Interlocal Agreement for the Administration of the Green River Flood Control Zone District* was effective November 15, 2002 and its primary purposes are to:

1.) continue to provide a vehicle for interagency coordination and cooperation among the parties on flood hazard reduction planning, programs and projects within the District;
2.) provide integrated policy and technical advisory input to the Green River Flood Control Zone District through the Executive and Technical Committees;
3.) develop and implement contemporary standards and procedures for operating, maintaining and repairing river flood protection facilities and pump stations within the District to maximize public health and safety that are consistent with the requirements of the federal Endangered Species Act and other applicable federal, state and local laws and regulations; and
4.) provide a coordinated interjurisdictional mechanism to: (a) more efficiently and effectively implement flood hazard reduction measures and programs in the Green River Flood Control Zone District; (b) cooperate with federal, state, local, and other agencies and parties having jurisdiction and/or resources to support enhanced flood hazard reduction in the Green River Flood Control Zone District; and (c) coordinate and improve flood warning, emergency response and disaster recovery with the Federal Emergency Management Agency, the U.S. Army Corps of Engineers, the Washington State Emergency Management Division, and, as appropriate, other federal, state and local agencies.

Prior to 1990, the Green River Basin Program was funded by a cost-share arrangement between King County and the Green River cities. Since the activation of the District in 1990, activities are funded by an ad valorem tax levy on all properties within its boundaries.

GREEN RIVER FLOOD CONTROL ZONE DISTRICT

The Green River Flood Control Zone District was formed in 1960 by Resolution 31192 of the King County Board of Commissioners with concurrence from the affected lower Green River valley cities and activated in December 1990. The purpose of the District is to provide a funding base for operation and maintenance of levees, revetments and pump stations on the Green River within the District's boundaries, and to fund administration of the Green River Flood Control Zone District.

The District encompasses areas within seven cities, five Metropolitan King County Council Districts, four State legislative districts, three Congressional districts and portions of unincorporated King County. It approximates the drainage basin of the lower Green River Valley, contains approximately 44,000 acres, and has a total assessed valuation in 2002 of $18.1 billion. A map of the District is shown on page 5 of this report.

In accordance with state law regarding special purpose districts, the Green River Flood Control Zone District is a quasi-municipal corporation legally separate from King County and an independent taxing authority of the State of Washington authorized by Chapter 86.15 of the Revised Code of Washington. However, the District's Board of Supervisors, by Washington State statute, is served by the King County Council who are explicitly responsible for the governance of the District.

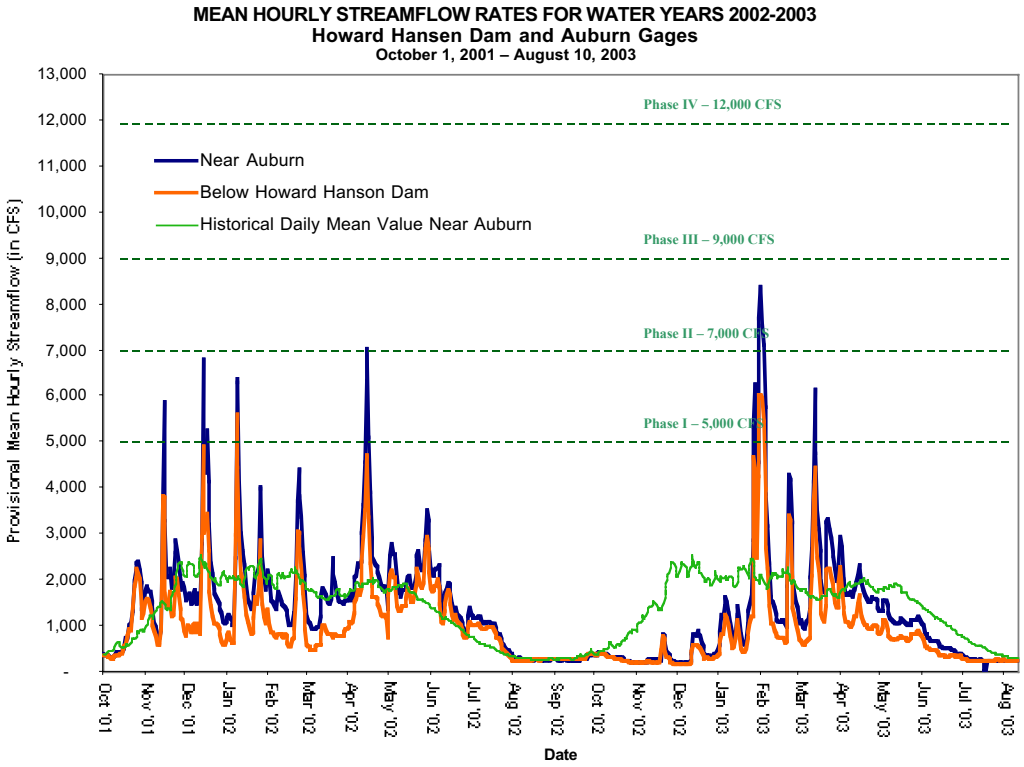
Flood Summary for Water Years 2002-2003

Since the beginning of the 2002 water year on October 1, 2001, the Green River has been absent of significant flood events largely due to the lack of precipitation and rain-on-snow events during the past two winters which are characteristically the cause of major flood events. During normal years, the Green River will experience an average of two to three minor Phase II flood events per season and a more significant Phase III flood events on average occurring once every two to three years. Between October 2001 and August 2003, flood events on the Green River have been comparatively typical of normal years.

As indicated on the following mean hourly flow graph, since the beginning of the 2002 water year as measured at the Auburn gauge the Green River exceeded the Phase I flood thresholds of 5,000 cubic feet per second (CFS) six times and of these six events, two exceeded Phase II (7,000 CFS) flood thresholds. The Phase II high water event on the Green River occurred during a period between January 26 and February 5, 2003 when the Auburn gauge measured flows between 3,150 and 8,800 CFS with the maximum real-time flow occurring on January 31 in the early evening.

The flows on the lower Green River are a direct function of the U.S. Army Corps of Engineers' (USACE) operations of the Howard Hanson reservoir since the majority of flow in the Green River is contributed from the upper watershed as a controlled release from the reservoir. It is important to note that the USACE's operations of the Howard Hanson reservoir can have significant relationship to the District's flood protection facilities. King County works closely with the USACE to establish outflow rates that do not adversely affect facility slumping problems. Rapid cutting of outflows results in

an excessive draw-down effect downstream of the reservoir. Conclusions from a slope stability analysis completed by Shannon & Wilson, Inc. under contract by the District revealed that some one of the worse case scenarios for damage to Green River facilities are rapid draw-down of flows following a period when the river is maintained at half of the bank-full limits.



Green River Near Auburn (USGS #12113000): At river mile 32.0, 1.8 miles downstream from Big Soos Creek. Drainage area is approximately 399 square miles.

Green River Below Howard Hanson Dam (USGS #12105900): Located 0.7 miles downstream from Howard Hanson Dam with a contributing drainage area of approximately 221 square miles. Flows at this site as a result are regulated by the operations of Howard Hanson Dam.

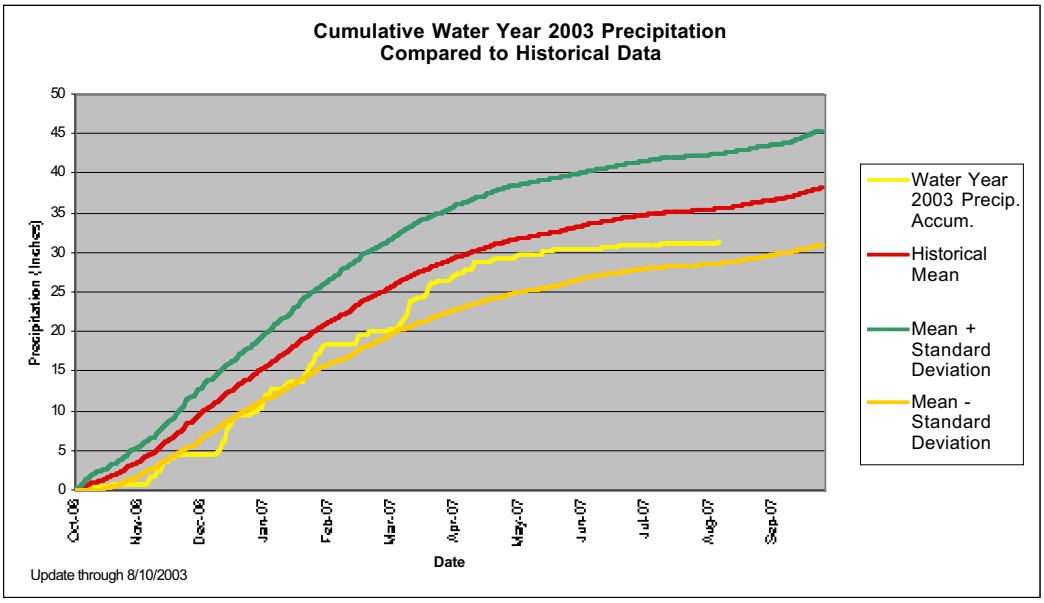
Streamflow: Also referred to as discharge, streamflow is the volume of water flowing past a given point in the stream in a given period of time. Streamflow is reported as cubic feet per second (ft3/s).

2002-2003 Water Year Precipitation Totals

Through August 10, the 2003 water year precipitation amounts or rain and snow have been well below average in the Green River watershed as well as other regions throughout Western Washington. Precipitation has generally ranged from 73-percent in the Snoqualmie, Cedar and Skykomish watersheds to 77-percent in the Green, White and Puyallup watersheds for the 2003 water year since beginning October 1, 2002.

Below is the accumulated precipitation at SeaTac beginning October 1, 2002 through August 10, 2003 for the current 2003 water year. In addition to precipitation accumulation totals are the historical mean accumulated rainfall and the standard deviations of the cumulative mean is shown by calendar day for the water year (October 1–September 30). As the graph indicates (updated daily at http://dnr.metrokc.gov/hydrodat/seatacprecip.asp), precipitation for the 2003 water year is below the historical mean by approximately four inches as of August 10.

The National Weather Service's Climate Prediction Center has concluded that recent observed trends and current atmospheric and oceanic conditions in the tropical Pacific are near average (ENSO-neutral) and do not support the development of either La Niña or El Niño during the winter 2003-2004 flood season. Therefore normal precipitation patterns are expected in the Northwest during the first half of the 2004 water year.



Map 1

GREEN RIVER FLOOD CONTROL ZONE DISTRICT

Map 2 Detail

Map 3 Detail

TUKWILA
SEATAC
RENTON
KENT
DES MOINES
FEDERAL WAY
AUBURN
Black River
Springbrook Creek
Panther Lake
Angle Lake
Green River
Lake Fenwick
Star Lake
Lake Doloff
Mill Creek
Green River
599
900
MARTIN LUTHER KYNG JR BLVD
99
5
518
405
515
181
167
516
18
164
INTERURBAN AV S
RAINIER AV S
GRADY WY
S 188TH ST
S 200TH ST
ORILLIA RD S
WEST VALLEY HWY
84TH AV S
E VALLEY RD
S 212TH ST
BENSON RD
S CENTRAL AV
JAMES ST SE
SE 240TH ST
104TH AV SE
AUBURN WAY N
MILITARY RD S
REASLEY CANYON RD
MAIN ST W
AUBURN AVE
HARVEY RD NE

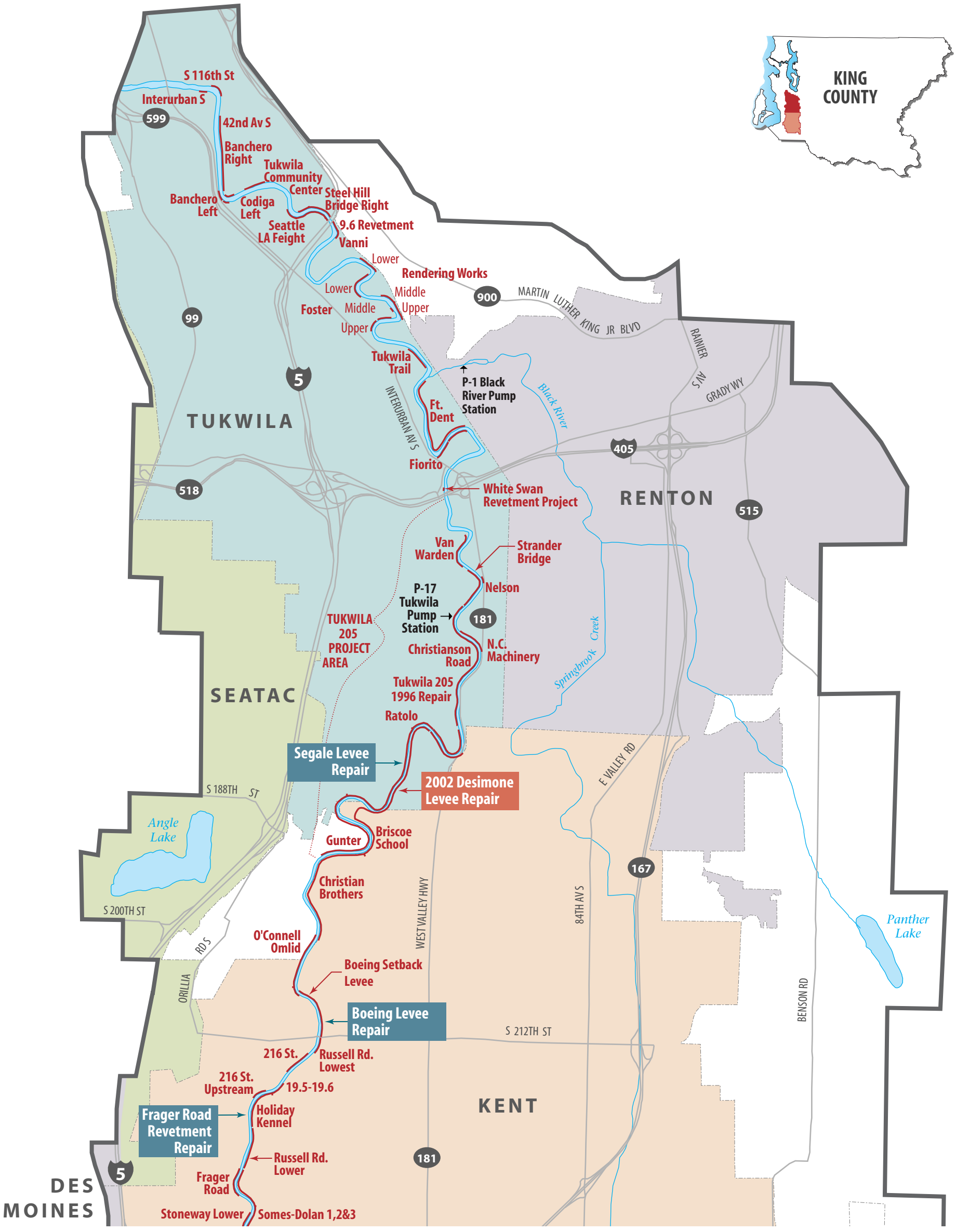
N

0 1 2 Miles

August 2003

King County

Department of Natural Resources and Parks
Water and Land Resources Division
Flood Hazard Reduction Services Section



Map 2

GREEN RIVER FLOOD CONTROL ZONE DISTRICT

North Portion

- Name — Proposed 2003-2005 Construction Projects
- Name — 2002 Constructed Projects
- Levee/Revetment
- Lake/River
- Stream
- Major Road

N

0 1/2 1 Mile

August 2003

King County

Department of Natural Resources and Parks
Water and Land Resources Division
Flood Hazard Reduction Services Section

DES MOINES

KENT

FEDERAL WAY

AUBURN

Frager Road
Moline Section
Russell Rd. Lower Site 3
Stoneway Lower
Somes-Dolan 1,2&3
Stoneway Upper
Russell Rd. Upper
Corps GR1-75
Narita Levee Repair
2002 Pipeline Levee Repair
Maddox
Myers Golf
Leber Brothers
Okimoto
Signature Point Upper
Country Road #8
Hawley
Koch
Corps Revet
Frager Road Upper
P,D&J Packing
Bradley
Milwaukee #1
#2
McCoy-Breda
U.P.R.R. Pump Station
Kent Airport
78 AV South
Horseshoe Acres
Plemmons
Monk
Nursing Home
Nursing Home Ext.
Kent Pump Plant
Titus Boat Ramp
Titus Pit
Jeff Estates
Green River Lower
Neilson
Mallory
Malnati
Reddington Section
Auburn Golf & Olson
Brannon
Galli's Section
Valentine Road
104 Road Protection
Dykstra
30.5 Road Protection (Pig Farm)
Lone's Addition
Porter Bridge
Matson
Barnett
Porter Gage
Fenster Revetment Repair
Pautzki
Railroad
Mueller
Lake Holms Road
Soos Creek

Lake Fenwick
Star Lake
Lake Doloff
Mill Creek

JAMES ST SE
SE 240TH ST
S CENTRAL AV
104TH AV SE
WEST VALLEY HWY
AUBURN WY N
AUBURN AV NE
MAIN ST W
MILITARY RD S
PEASLEY CANYON RD
HARVEY RD NE

5
181
516
515
167
18
164

Map 3

GREEN RIVER FLOOD CONTROL ZONE DISTRICT
South Portion

Name — Proposed 2003-2005 Construction Projects

Name — 2002 Constructed Projects

Levee/Revetment

Lake/River

Stream

Major Road

N

0 1/2 1 Mile

August 2003

KING COUNTY

King County

Department of Natural Resources and Parks
Water and Land Resources Division
Flood Hazard Reduction Services Section

2002 ACCOMPLISHMENTS

Green River Flood Control Zone District work program accomplishments in 2002 included:

- Completed consultation under Section 7 of the Endangered Species Act for the Lower Green River Biological Assessment with the U.S. Army Corps of Engineers, National Marine Fisheries Service and U.S. Fish and Wildlife Service for seven proposed 2002–2004 levee and revetment projects. Two of the projects identified in the Lower Green River Biological Assessment were constructed in 2002.
- Completed the final phase of the Desimone Levee repair project at a cost of $562,957 with $64,000 in grant funds from the Washington State Department of Ecology's Flood Control Assistance Account Program (FCAAP); an additional $40,000 in FCAAP grant funds were secured towards this project in 2003 and will be recorded as revenue in the 2003 annual report. The first two phases of this three-phase project to repair and structurally stabilize the levee were completed in 1998 and 1999 at a cost of $442,435 and $309,608, respectively, with financial support from the Federal Emergency Management Agency and Washington State Emergency Management Division. Total cost of this project was $1,315,000.
- Completed the final phase of the Pipeline Levee project at a cost of $219,954 exclusively funded by the Green River Flood Control Zone District. The first phase of this two-phase project to repair and structurally stabilize the levee damaged by the 1995 and 1996 floods was completed in 1999 at a cost of $354,922 with financial support provided by the Federal Emergency Management Agency and Washington State Emergency Management Division. Total cost of this project was $574,876.
- Organized the planting of over 7,000 native riparian tree and shrub species at Desimone and Pipeline project sites by citizen volunteers from Microsoft, Northwest School, Bellevue Community College, Girl Scout Troops 1620 & 2126, Rainier Valley Pre-School, and Thomas Academy with assistance from EarthCorps staff.
- Finalized the preliminary risk-based analysis under contract with Shannon & Wilson, Inc. to determine potential flooding-related damage and the expected annual damage to structures and structure contents that could occur in the Green River Flood Control Zone District as a result of levee and revetment instability.
- Completed annual Green River Flood Control Zone District flood protection facility maintenance assessments. Included inspections of the U.S. Army Corps of Engineers' Section 205 Tukwila and Horseshoe Bend projects for preparation of the Annual Reports that are required by the Corps.
- Conducted vegetation management at selected flood protection facility sites to maintain their eligibility for the U.S. Army Corps of Engineers' PL84-99 emergency repair cost sharing program, including the Tukwila and Horseshoe Bend Section 205 projects.
- Provided ongoing daily operations and maintenance at the Black River, Tukwila and Southcenter Pump Stations. Tracked results from smolt counter at the Black River Pump Station in cooperation with the cities of Kent and Renton, and the Muckleshoot Indian Tribe.

- Continued the implementation of the monitoring and assessment program for completed and proposed major maintenance projects as required by local, State and Federal permits. The monitoring program provides essential baseline and post-construction data for project performance analysis and fish habitat utilization at project sites.
- Continued participation and coordination of project development with the U.S. Army Corps of Engineers' on the Green/Duwamish Ecosystem Restoration Project for projects that will affect mainstem Green River flood protection facilities.
- Executed a new 10-year interlocal agreement for the management and administration of the Green River Flood Control Zone District between King County and the Cities of Auburn, Tukwila, Renton and Kent. This multi-jurisdictional interlocal agreement provides a coordinated approach to address flood hazard reduction planning, the repair and operation of critical flood protection facilities, flood warning and emergency response, and integrated resource management.
- Developed, monitored, and tracked the budget and work program for the Green River Flood Control Zone District including the preparation of the 2001 Annual Report.
- Responded to the preliminary inquiries from the Washington State Auditor's Office on a routine audit of the Green River Flood Control Zone District for the period of January 1, 1997–December 31, 2001. An Accountability Audit Report was issued by the Auditor's Office on April 11, 2003 concluding that the Green River Flood Control Zone District complied with applicable state laws and regulations and its own policies and procedures as well as an evaluation of its public assets.
- Coordinated and staffed the Green River Flood Control Zone District's Technical Committee and Executive Committee meetings and schedule.
- Provided technical assistance to WRIA 9 committees on salmon conservation planning efforts and projects, and representation of Green River flood management issues in these processes.
- Finalized administrative closeout on the Winter Storms (FEMA-1079-DR) federal disaster with the Federal Emergency Management Agency and the Washington State Emergency Management Division and received $31,940 in indirect administrative allowance.
- Worked cooperatively with the City of Tukwila to request reimbursement from the Federal Emergency Management Agency's Public Assistance Program under the Nisqually Earthquake disaster declaration for the White Swan Revetment repair project completed in 2001. The White Swan Revetment was damaged as a result of the earthquake which ruptured a water main landward of the facility and caused extensive erosion damages to the revetment. In 2003, the District received via the City of Tukwila $39,976 towards the project costs which will be recorded as revenue in the 2003 Annual Report.
- Implemented the Flood Response Manual and Post-Flood Recovery Plan, including enhanced coordination with the Green River cities and organization of the annual Interagency Flood Preparedness meeting for the Green River.
- Initiated the coordination of a memorandum of understanding and agreement with King County's Department of Transportation to use a Green River Flood Control Zone District-owned parcel for a stream buffer enhancement project identified in the Wetland Mitigation Plan for the South 277th Street Reconstruction Phase III Project.

AUTHORIZED 2002 BUDGET

The 2002 Green River Flood Control Zone District budget was approved in Resolution No. GR 27, adopted by the King County Council on November 19, 2001. The King County Council serves as the District's Board of Supervisors.

The District's authorized budget was consistent with Basin Executive Committee's recommendations adopted at their October 24, 2001 meeting based on $799,427 in estimated District property tax levy revenues. Together with $555,643 authorized to supplement the major river facility repair projects from the District's undesignated fund balance and $50,000 from the District's designated fund balance for performance upgrades at the Black River Pump Station, the total District budget authorized for 2002 was $1,405,070. The District's 2002 authorized budget is exclusive of $30,000 in carryover spending authority that was encumbered from the 2001 budget to pay the contractual obligations for the risk-based analysis. The District's combined total spending authority in 2002 was $1,435,070.

Per the resolution, the District's budget was structured into the following categories:

APPROVED 2002 BUDGET

District Administration:	$ 299,153
District Maintenance:	
• Major River Facility Repair Projects	$ 729,632
• Pump Station Operation and Maintenance	$ 243,537
• Annual Routine Maintenance	$ 49,675
• Performance Monitoring	$ 32,773
Carryover Encumbrances from 2001:	$ 30,000
Contribution to Designated Fund Balance:	
• Local Flood Match Funds	$ 11,000
• Pump Station Equipment Repair/Replacement	$ 39,300
Total Approved 2002 Spending Authority:	**$ 1,435,070**

Ad Valorem Tax Levy

This District is funded by an ad valorem tax levy on all properties within its boundaries. The District levy rate in 2002 was 0.04846 cents per $1,000 of assessed valuation. Therefore, for example, the owner of a $200,000 home in the District paid approximately $9.69 to the District levy, a decrease of $0.31 from 2001 in addition to a $0.41 decrease between years 2000 and 2001. The increase in the 2002 levy was held to the limitations of the maximum 1% increase established under Initiative 747 and within the Implicit Price Deflator (IPD) levels as established by Referendum 47, which in 2002 the IPD was 1.89%.

The District's 2002 net tax and levy collections totaled $789,863. The difference between projected and actual collections is due to various factors which affect general property tax collections (e.g., assessed property value fluctuations, delinquencies, new construction, and ad valorum tax refunds).

For a full accounting and description of the District's actual expenditures, revenues, and year-end 2002 fund balance total, see the 2002 Year-End Revenue and Expenditure Report and the 2002 Year-End Fund Balance sections of this report.

2002 MAJOR MAINTENANCE PROJECTS

Desimone Levee Toe Repair
River Mile: 15.4, Right Bank, City of Tukwila
Cost: $ 562,957

The Desimone Levee repair site is located along the right bank of the Green River at River Mile 15.4 within the City of Tukwila. The portion of the overall Desimone Levee involved in the repairs extends from the southerly city limits of Tukwila for some 1,320 feet downstream. The levee was originally constructed in the early 1970's using a crane and dragline bucket to shape the bank to slope varying between 1.5 vertical feet to every horizontal foot (1.5V:1H), up to a slope inclination of 1.75V:1H. The face of the slope and the raised levee fill were both constructed of a mixed combination of native riverbank alluvial soil materials and imported pitrun gravels and cobbles. The finished slope of the riverbank was covered to a depth of from two to three feet with small diameter rip-rap quarry stone, ranging from about eight inches up to two feet in average diameter.

Access to the water for completion of levee toe repairs was obtained by excavation along a broad bench created in previous levee setback construction phases of the overall Desimone Levee Repair Project.

Over the years miscellaneous river-borne sand and silt deposits covered portions of the midslope, creating a narrow depositional bench with sloughing, oversteepened slopes extending from the edge of the bench down to the bed of the river. During periods of falling river stages following flood saturation of the riverbanks, the slumps created by this process also dislocated the underlying riprap armor cover, gradually oversteepening the lower levee slopes and leading to concerns regarding overall levee stability. Damages were especially evident following flooding in 1990, and again in the 1995 and 1996 water years.

Geotechnical studies performed for Green River levees by consultants to the Green River Flood Control Zone District specified that levee slopes would need to be rebuilt to a minimum overall 2H:1V slope inclination. These studies also determined that overall slope stability could be enhanced through the construction of mid-slope benches to buttress the overall height of the embankments. Following negotiations with the City of Tukwila, which operates and maintains a paved recreational trail along the levee crest, developers constructing a nearby commercial warehouse agreed to modify their building plans to accommodate the additional landward footprint needed for reconstruction of the levee to the recommended geotechnical specifications. Design of site improvements such as waterlines, fire hydrants, and landscaping was carefully integrated with the setback levee repair geometry.

Working from the bench, eroded levee toe areas were over-excavated and reconstructed using large rock to create habitat niches and buttress the levee slopes. A series of large logs with intact rootwads was chained to anchor rocks to further deflect flows and create additional habitat opportunities along the toe.

Lower levee slopes were then reconstructed with layers of soil and live willow cuttings. Fill lifts were protected against erosion using biodegradable coir fabric wraps.

Finished excavated bench areas were reconstructed, planted with willows, hydroseeded, and watered to ensure vegetaive survival for long-term erosion control and slope stabilization.

Actual repairs involving setback levee reconstruction and slope stabilization repairs were accomplished in three phases, due to a combination of cost constraints and concerns with pending listing of Puget Sound Chinook salmon as threatened under the Endangered Species Act (ESA); therefore, construction of instream portions of the project were deferred until 2002.

During 1998, an 800-foot-long downstream portion of the levee setback repair reach was built simultaneously with construction of the warehouse on the adjoining site. The setback levee was constructed starting with a landward toe seepage drain, followed by compacted lifts of select fill raised to the flood containment freeboard elevation. Crushed base course gravel for construction of a new paved trail were then compacted in place along the crest of the new setback levee alignment, and a twelve foot-wide paved recreational trail constructed the length of the setback. Oversteepened levee slopes were then excavated the full length of the setback reach to create a stable slope angle, leaving a midslope bench to help buttress the upper levee slopes. Work completed in 1998 in this reach of the project cost a total of $442,435.

In 1999, an additional 520 feet of levee was reconstructed in an identical manner, at the upstream end of the levee repair reach. Again, instream portions of the levee repairs were deferred, as ESA listings were now finalized. During this time period, preparation of a detailed Biological Assessment (BA) for compliance with Section 7 of the ESA was also initiated. Work was completed at the Desimone site above the elevation of the Ordinary High Water Mark (OHWM) This consisted of a landward levee seepage drain, compacted lifts of select levee fill to construct the setback levee section, paving of the relocated trail, and excavation of oversteepened slopes to create a midslope bench above the OHWM. Work completed in 1999 cost a total of $309,608.

Following review and approval of the BA for the Desimone Levee the final phase of project construction was completed with instream levee toe repairs in the summer of 2002. Toe repairs involved further excavation of the midslope bench to provide full access to the toe of slope along the edge of the riverbank, together with clearing of the remaining stands of invasive, non-native blackberry and reed canarygrass vegetative cover. Following installation of a floating turbidity control curtain, failed levee toe materials were excavated from the toe area down to the bed of the river, and large diameter quarry stone placed for structural support, and to create a variety of structural niches suitable for juvenile salmonid habitat use. Log anchor chains were then attached to additional quarry stones embedded into the

toe buttress, and then fastened to a series of 62 coniferous logs with intact rootwads. The logs were secured in place below the OHWM along the full length of the levee toe, serving as flow deflectors and providing both cover and velocity controlled refugia for juvenile salmonids.

Lower embankment slopes above the completed rock and log toe buttress structure were then rebuilt with layered lifts of compacted fill soils, wrapped with biodegradable geotextile fabric for structural enhancement and erosion control. Layers of live native willow cuttings obtained from previous Green River levee repair sites were placed in lifts of topsoil spread between each coir-fabric-wrapped fill layer. Additional native riparian tree and shrub species were planted into the topsoil lifts along with the willow cuttings. Additional plantings were then installed on the midslope bench and lower embankment slope areas, with the help of community volunteers. All plantings were watered at regular intervals until the onset of fall rains. The site will continue to be monitored for structural stability, plant growth and survival, and fish habitat utilization.

The total cost of the toe repairs, slope stabilization, and plantings completed during 2002 was $562,957. The overall project cost of this three phase project to repair and structurally stabilize the Desimone Levee was $1,315,000.

Pipeline Levee Toe Repair
River Mile: 22.0, Right Bank, City of Kent
Cost: $ 219,954

The Pipeline Levee repair site is located along the right bank of the Green River at River Mile 22.0 within the City of Kent. The portion of the overall Pipeline Levee involved in the repairs extends from the southerly end of Russell Road for some 600 feet upstream. The levee was originally constructed in the mid-1960s using a crane and dragline bucket to shape the bank to slope at 1.5 vertical feet to every horizontal foot (1.5V:1H). The face of the slope and the raised levee fill were both constructed of a mixed combination of native riverbank alluvial soil materials and imported pitrun gravel and cobbles. The finished slope of the riverbank was covered to a depth of from two to three feet with small diameter rip-rap quarry stone, ranging from about eight inches up to two feet in average diameter.

Access to the water for completion of levee toe repairs was obtained by excavation along a broad bench created in previous levee setback construction phases of the overall Pipeline Levee Repair Project.

Over the years miscellaneous river-borne sand and silt deposits covered portions of the midslope, creating a narrow depositional bench with sloughing, oversteepened slopes extending from the edge of the bench down to the bed of the river. During periods of falling river stages following flood saturation of the riverbanks, the slumps created by this process also dislocated the underlying riprap armor cover, gradually oversteepening the lower levee slopes and leading to concerns regarding overall levee stability. Damages were especially evident following flooding in 1990, and again in the 1995 and 1996 water years.

Working from the bench, eroded levee toe areas were over-excavated and reconstructed using large rock to create habitat niches and buttress the levee slopes.

A series of large logs with intact rootwads was chained to anchor rocks to further deflect flows and create habitat opportunities along the toe. Additional log clusters were imbedded into a series of shallow habitat embayments excavated into the channel margins along the length of the lower bench.

Geotechnical studies performed for Green River levees by consultants to the Green River Flood Control Zone District specified that levee slopes would need to be rebuilt to a minimum overall 2.25H:1V slope inclination. These studies also determined that overall slope stability could be enhanced through the construction of mid-slope benches to buttress the overall height of the embankments. Following negotiations with the City of Kent, which operates and maintains a paved recreational trail along the levee crest, and the adjoining apartment building property owners, an additional easement width was obtained over the margins of an existing detention pond to accommodate the additional landward footprint needed for reconstruction of the levee to the recommended geotechnical specifications. Negotiations to secure this easement area continued late into the 1998 construction year, with the result that actual repairs were delayed until 1999.

Actual repairs involving setback levee reconstruction and slope stabilization repairs were accomplished in two phases, due to a combination of cost constraints and concerns with pending listing of Puget Sound Chinook salmon as threatened under the Endangered Species Act (ESA). During 1998 an 500-foot-long downstream portion of the levee setback repair reach was constructed working strictly above the elevation of the Ordinary High Water Mark (OHWM). The setback levee was constructed starting with a landward toe seepage drain, followed by compacted lifts of select fill raised to the flood containment freeboard elevation. Crushed base course gravel for construction of a new paved trail were then compacted in place along the crest of the new setback levee alignment, and a twelve foot-wide paved recreational trail was constructed the length of the setback. Oversteepened levee slopes were then excavated the full length of the setback reach to create a stable 2.25H:1V slope angle, leaving a midslope bench to help buttress the upper levee slopes. Work completed in 1999 in this reach of the project cost a total of $354,922.

The remaining instream portions of the levee repairs were deferred for the next three years as the ESA listing were finalized. During this time period, preparation of a detailed Biological Assessment (BA) for compliance with Section 7 of the ESA was initiated. Following review and approval of the BA for the Pipeline Levee, the final phase of project construction was completed with instream levee toe repairs in the summer of 2002. Toe repairs involved further excavation of the midslope bench to provide full access to the toe of slope along the edge of the riverbank, together with clearing of the remaining stands of invasive, non-native blackberry and reed canarygrass vegetative cover. Following installation of a floating turbidity control

curtain, failed levee toe materials were excavated from the toe area down to the bed of the river, and large diameter quarry stone placed for structural support, and to create a variety of structural niches suitable for juvenile salmonid habitat use.

A series of shallow embayments were then excavated along the margins of the lower bench and secured against erosion with additional quarry stone. The function of these embayments is to serve as shallow marginal habitat for juvenile salmonids, as well as serving as a series of structural flow deflectors along the higher velocity margins of the outer river bend in this location. Large coniferous logs with intact rootwads were embedded into the toe rock within the embayments to serve as cover and velocity-controlled refugia for juvenile salmonids as well as to further serve as flow deflector elements along the levee toe. Log anchor chains were then attached to additional quarry stones embedded into the toe buttress, and then fastened to a series of 25 coniferous logs with intact rootwads. The logs were secured in place below the OHWM along the full length of the levee toe, serving as flow deflectors and providing both added cover and velocity control for juvenile salmonids.

Lower embankment slopes above the completed rock and log toe buttress structure were then rebuilt with layered lifts of compacted fill soils, wrapped with biodegradable geotextile fabric for structural enhancement and erosion control. Layers of live native willow cuttings obtained from previous Green River levee repair sites were placed in lifts of topsoil spread between each coir-fabric-wrapped fill layer. Additional native riparian tree and shrub species were planted into the topsoil lifts along with the willow cuttings. Additional plantings were then installed on the midslope bench and lower embankment slope areas, with the help of community volunteers. All plantings were watered at regular intervals until the onset of fall rains and the site will continue to be monitored for structural stability, plant growth and survival, and fish habitat utilization.

The total cost of the toe repairs, slope stabilization, and plantings completed during 2002 was $219,954. The overall project cost of this two phase project to repair and structurally stabilize the Pipeline Levee was $574,876.

Lower slope margins were reconstructed using layers of live willow cuttings between lifts of fill soil protected with biodegradable coir fabric. Finished slope areas were also protected with a covering of coir fabric, hydroseeded, planted with native tree and shrub species, and watered to ensure plant survival for long-term erosion control and slope stabilization.

2002 YEAR-END REVENUE AND EXPENDITURE REPORT

2001 YEAR END FUND BALANCE

The District's 2002 Budget started with a fund balance as of December 31, 2001 of $1,120,882 as reported in the District's 2001 Annual Report. Of this amount, $496,630 was set-aside in a designated fund balance allotment for pump station repairs and equipment replacement in the amount of $388,023 and the balance of $108,607 as a source of matching funds to leverage potential future state and federal assistance for flood damage repairs. The remaining $624,252 of fund balance was undesignated.

ACTUAL 2002 REVENUE

The District's actual cash revenue in 2002 totaled $931,884. This was comprised of $789,863 in net levy and tax revenues; $46,081 in interest income from the designated and undesignated fund balance; $64,000 in grant funds from the Washington State Department of Ecology for the Desimone Levee project; and $31,940 in indirect administrative allowance from the Federal Emergency Management Agency following closeout of the Winter Storms (FEMA-1079-DR) federal disaster.

Source of Revenue	Amount
2002 Actual Levy and Tax Revenues:	$ 789,863
Interest Income from Designated and Undesignated Fund Balance:	$ 46,081
Washington State Department of Ecology Grant Funds:	$ 64,000
Federal Emergency Management Agency:	$ 31,940
Total District Revenue:	**$ 931,884**

ACTUAL 2002 EXPENDITURES

The combined District administration and maintenance expenditures during 2002 totaled $1,320,288. These expenditures and charges are divided into three separate budget categories: (1) administration, which includes Green River Flood Control Zone District management; (2) maintenance, which includes pump station operations and maintenance, major river facility repairs, annual facility maintenance & vegetation management, and project performance monitoring; and (3) designated fund balance contributions. During 2002, $203,182 was spent on administration activities, $1,066,806 on repair and maintenance programs; and $50,300 set aside for the designated fund balance contribution. These actual expenditures are further detailed in the following table:

Administration	
Program/District Management Labor Costs:	$ 139,431
Indirect/Overhead Assessment:	$ 63,751
Administration Sub-total =	$ 203,182
Maintenance	
Pump Station Operation and Maintenance:	$ 163,728
Major River Facility Repair Projects:	$ 782,911
Facility Maintenance & Vegetation Management:	$ 65,303
Project Performance Monitoring:	$ 23,957
Risk Analysis:	$ 30,907
Maintenance Sub-total =	$ 1,066,806
Designated Fund Balance	
Contribution to the Designated Fund Balance:	
Local Flood Match Funds	$ 11,000
Pump Station Equipment Repair/Replacement	$ 39,300
Designated Fund Balance Sub-total =	$ 50,300
Total Program Expenditures =	**$ 1,320,288**

DISTRICT ADMINISTRATION

Program and District administrative expenditures in 2002 supported a combination of two full-time staff positions. In addition, the administration budget provided support to all District activities including:

- coordination of major and annual routine maintenance related work for various projects (e.g., site investigations, survey, engineering design, permit applications and coordination, oversight of construction crews and equipment, overall project management);
- executing a new 10-year interlocal agreement for the management and administration of the Green River Flood Control Zone District between King County and the Cities of Auburn, Tukwila, Renton and Kent;
- federal and state disaster assistance coordination (e.g., closeout of the Winter Storms federal disaster FEMA-1079-DR);
- grant contract management and administration (e.g., Washington State Department of Ecology Flood Control Assistance Account Program);
- annual budget development, analysis and tracking;

- preparation of annual resolutions for the District's Board of Supervisors and levy certification for King County's Department of Assessments;
- technical assistance to lower Green River Valley cities and other resource agencies such as the U.S. Army Corps of Engineers, the Soil Conservation Service, and the United States Geological Survey;
- preparation of District's 2001 Annual Report;
- participation and coordination with other Green/Duwamish (WRIA 9) Watershed activities; and
- ongoing coordination of the District's Technical Committee and Executive Committee meetings.

Administrative Expenditures

Salaries:	$ 118,960
Labor Benefits, Industrial Insurance, Social Security:	$ 17,651
Materials, Office Supplies, Printing, Training:	$ 2,820
WLRD Overhead:	$ 63,751
Total:	**$ 203,182**

DISTRICT MAINTENANCE

The District's maintenance budget includes all costs for the maintenance and operations of the Black River (P-1), Tukwila (P-17) and Southcenter/Segale pump stations; major river facility repairs and projects; and the annual maintenance and vegetation management program. Also, because of the direct association to the District's major maintenance programs and projects, the expenditures for project monitoring and assessment, and the risk analysis are also included in the District's maintenance category.

Summary of District Maintenance Expenditures

Pump Station Operation and Maintenance:	$ 163,728
Major River Facility Repair Projects:	$ 782,911
Facility Maintenance & Vegetation Management:	$ 65,303
Project Monitoring and Assessment:	$ 23,957
Preliminary Risk-Based Analysis:	$ 30,907
Total:	**$ 1,066,806**

Pump Station Operations and Maintenance

The pump station expenditures in 2002 includes one full-time pump station operator to oversee all the operations and maintenance of the Black River, Tukwila and Southcenter/Segale pump stations. In addition to the routine operations and maintenance, the pump station operator carries out many other activities, including:

- overseeing the seasonal in-migration of anadromous salmon and resident cutthroat trout and steelhead normally between mid-September and January 31st;
- overseeing the seasonal downstream out-migration passage from early April to mid-June of anadromous salmon and resident cutthroat trout and steelhead;
- coordination of fish migration data with the Cities of Renton and Kent, and the Muckleshoot Indian Tribe;
- grounds and property maintenance including the removal of trash and debris that collects in the forebay of the Black River pump station on a continuing basis; and
- coordination of annual inspections with the City of Renton's Fire Prevention Bureau and the Occupational Safety and Hazard Administration (OSHA) inspections at the Black River pump station.

Pump Station Operations and Maintenance Expenditures

Salaries:	$ 60,814
Labor Benefits:	$ 16,212
Labor Overhead:	$ 22,278
Utilities – Electricity, Natural Gas, Water, Diesel:	$ 50,172
Materials and Supplies:	$ 2,040
Contract Maintenance Services:	$ 5,445
Equipment:	$ 6,437
Permits:	$ 330
Total:	**$ 163,728**

Major River Facility Repair Projects

For the District's major facility repair maintenance projects, the expenditures include all labor and the associated benefits and overhead charges, materials, supplies and equipment for the completion of the Desimone Levee and Pipeline Levee repair projects (see pages 15-19 for more detailed information on these two projects).

Major River Facility Repair Project Expenditures

Salaries:	$ 243,440
Labor Benefits:	$ 59,850
Labor Overhead:	$ 96,443
Materials, Supplies, Debris Disposal, Permits:	$ 218,972
Contract Services (e.g., Rental Equipment):	$ 73,972
King County Equipment:	$ 90,234
Total:	**$ 782,911**

Annual Maintenance & Vegetation Management Program

The District's annual maintenance and vegetation management program includes non-native vegetation removal and mowing of District facilities including the Tukwila and Horseshoe Bend Section 205 projects as required under the U.S. Army Corps of Engineers' Section 205 Program; noxious weed removal as required to carry out the mandates of state weed control law under Chapter 17.10 RCW; maintenance of access roads to the District's facilities necessary for inspections and flood patrol monitoring; interpretive sign placement; small repairs and maintenance projects to flap gates and culverts; and watering of native vegetation planted following the 1998–2002 major maintenance projects.

Annual Maintenance & Vegetation Management Program Expenditures

Salaries:	$ 19,378
Labor Benefits:	$ 5,348
Labor Overhead:	$ 10,838
Materials, Supplies, Permits:	$ 171
Contract Services (e.g., Rental Equipment):	$ 26,279
King County Equipment:	$ 3,289
Total:	**$ 65,303**

Project Monitoring & Assessment Program

The District's 2002 maintenance expenditures also include the costs for the project monitoring and assessment program for proposed and completed major maintenance projects to monitor structural stability, plant growth and survival, and fish habitat utilization. This program provides baseline and post-construction data for project performance analysis and fish habitat utilization at project sites so that the District can continue to adequately provide flood protection and further enhance the natural health of the Green River and its tributaries.

The project monitoring and assessment program is being carried out to comply with: 1) the statutory requirements set forth in local, State and Federal permits, specifically the Washington State Hydrologic Project Approval; and 2) the listing as threatened of Puget Sound chinook by the National Marine Fisheries Service in March 1999 and the listing as threatened of bull trout by the U.S. Fish and Wildlife Service in April 2001.

Data collected at previously constructed District projects will be used to demonstrate utilization by salmonids at these sites and for promoting future major river repair projects along the lower Green River.

Project Monitoring & Assessment Program Expenditures

Salaries:	$ 11,652
Labor Benefits:	$ 2,909
Labor Overhead:	$ 8,060
Materials and Supplies:	$ 798
King County Equipment:	$ 538
Total:	**$ 23,957**

Preliminary Risk-Based Analysis

A preliminary risk-based analysis study was initiated under contract with Shannon & Wilson, Inc., in 2001 and finalized in 2002 that examined the potential damages that could occur as a result of levee and revetment instability in the District. The objective of the study was to develop a preliminary estimate of the expected annual damage to structures and structure contents within the District's floodplain. The report may be viewed in its entirety on King County's web site at http://dnr.metrokc.gov/wlr/flood/21-1-09489-001.r1.pdf.

Further analyses are being pursued to expand on the findings in order to more accurately determine potential flood-related damages and the expected average annual avoided damages. The result of these analyses are intended to provide King County and other municipalities in the District with a foundation for developing a prioritized long-term levee and revetment repair, reconstruction and maintenance plan, and to provide the basis for securing additional revenue sources to accomplish the necessary maintenance and repair projects.

Preliminary Risk-Based Analysis Expenditures

Salaries:	$ 473
Labor Benefits:	$ 131
Labor Overhead:	$ 321
Consulting Services:	$ 29,982
Total:	**$ 30,907**

2002 YEAR-END DISTRICT FUND BALANCE

The District's fund began the 2002 year with $1,120,882 in total designated and undesignated fund balance. During 2002, the District realized a total of $982,184 in revenues and expended $1,320,288 in funds. Therefore, the 2002 fund balance realized a net decrease in the amount of $338,104.

The following table illustrate the activity to the District's fund in 2002.

2002 DISTRICT FUND ACTIVITY

2001 Year End Fund Balance:	$ 1,120,882
2002 Actual Net Levy and Tax Revenues:	$ 789,863
Interest Income from Designated and Undesignated Fund Balance:	$ 46,081
Washington State Department of Ecology Grant Funds:	$ 64,000
Federal Emergency Management Agency Disaster Close-Out:	$ 31,940
Designated Fund Balance Contribution:	$ 50,300
Total of 2002 District Expenditures:	$ (1,320,288)
2002 Year-End Fund Balance:	**$ 782,778**
Net Decrease to Fund Balance:	**$ 338,104**

Designated Fund Balance

On July 19, 1993 the Green River Flood Control Zone District's Board of Supervisors, passed Resolution No. GR1993-2 to set aside, or "designate," an initial amount of $94,230 from the District's undesignated fund balance for two specific purposes:

1) future use as local match for federal and state disaster assistance funding and grants following Presidential-declared flood disaster events; and
2.) repair, replacement and upgrades of equipment at the Green River pump stations.

Resolution No. GR1993-2 also established a process whereby $50,300 in District funds are set aside annually: $11,000 for local flood match and $39,300 for pump station equipment repair, replacement and upgrades. These designations were consistent with the recommendation approved by the Green River Basin Executive Committee on November 19, 1992 and are target figures based on annual District tax revenue collections.

Local flood match and pump station repair designations to date total $119,607 and $427,323, respectively, for a combined total of $546,930; the totals include the 2002 contributions. These designations are consistent with the Green River Basin Executive Committee and Basin Technical Committee recommendations in 1992.

Below in a table of the designated fund balance activity since its inception in 1993:

DESIGNATED FUND BALANCE ACTIVITY

Year	Flood Match	Equipment	Total	Annual Total
1993	$ 20,607	$ 73,623	$ 94,230	$ 94,230
1994	$ 11,000	$ 39,300	$ 50,300	$ 144,530
1995	$ 11,000	$ 39,300	$ 50,300	$ 194,830
1996	$ 11,000	$ 39,300	$ 50,300	$ 245,130
1997	$ 11,000	$ 39,300	$ 50,300	$ 295,430
1998	$ 11,000	$ 39,300	$ 50,300	$ 345,730
1999	$ 11,000	$ 39,300	$ 50,300	$ 396,030
2000	$ 11,000	$ 39,300	$ 50,300	$ 446,330
2001	$ 11,000	$ 39,300	$ 50,300	$ 496,630
2002	$ 11,000	$ 39,300	$ 50,300	$ 546,930
Total:	**$ 119,607**	**$ 427,323**	**$ 546,930**	

Pump Stations Equipment and Operations Analysis

The supplemental work program appended to the new *Interlocal Agreement for the Administration of the Green River Flood Control Zone District* directed King County staff to evaluate and, if appropriate, develop an update to the Pump Operations Procedures Plan that is consistent with contemporary standards and operating requirements. This evaluation will include an analysis and amortization schedule of the Black River pump station's equipment and facilities and to develop a repair and replacement plan consistent with the District's designated fund balance to ensure ongoing, seamless operation as well as striving to minimize future operational costs in terms of labor costs for operation and maintenance, and power costs to run the equipment.

Undesignated Fund Balance

Additional District fund balance revenues beyond the $50,300 designated on an annual basis are used to supplement Green River maintenance activities. These funds and additional income such as that from interest, grant revenue or property sales are set aside in the undesignated fund balance for future District needs. As of December 31, 2002 $235,848 was set aside in the undesignated fund balance.

Because of the outstanding maintenance needs in the District, the undesignated fund balance – as well as the designated fund balance for local flood match – provide an important means of supplementing the District's limited ability to complete necessary repair projects using only the annual levy revenues. With the limits in federal and state funds available for major river facility repair projects, the fund balance enables the District to continue to address existing, unrepaired facility damages. The fund balance also provides additional flexibility to respond to future flood events and new programs and requirements imposed upon the District's work program.

As shown in the table below, the District's total designated and undesignated fund balance at the end of 2002 is $782,788. As stated above, $546,930 of this total has been designated for local flood match and pump station purposes since 1993. This leaves the balance of $235,848 as undesignated fund balance. However, a total of $154,830 of the undesignated fund balance was authorized to supplement the 2003 maintenance program and therefore leaving an estimated balance of $81,018 at the end of the 2003 fiscal year exclusive of interest income, grant reimbursements or other sources of unexpected revenue that may be received.

2002 FUND BALANCE SUMMARY

Designated Fund Balance as of 12/31/02:	
• Local Flood Match Funds	$ 119,607
• Pump Station Equipment Funds	$ 427,323
Undesignated Fund Balance as of 12/31/02:	$ 235,848
Total Fund Balance as of 12/31/02:	**$ 782,788**

2003 BUDGET

The 2003 Green River Flood Control Zone District budget was approved by the District's Board of Supervisors on November 25, 2002 by Resolution No. GR 29. The levy rate for 2003 is 0.4686, or $0.04686 per $1,000 of assessed value; a property assessed at $200,000 would therefore pay approximately $9.37 per year. The 2003 levy is an estimated annual reduction of $0.32 per year from 2002 and a total annual reduction of $1.04 from the 2000 levy. Based on this levy rate, 2003 collections are expected to total $849,889.

The District's budget authorized by Resolution No. GR 29 specifies how projected revenue from the District levy will be disbursed. This resolution also specified that $154,830 out of the District's total undesignated fund balance of $235,848 is allocated to supplement the District's 2003 budget for major river facility repair projects. Consistent with the requirements of RCW 86.15.140, the District's budget is categorized as follows:

Overhead and Administration:	$ 264,542
Pump Station Operations and Maintenance:	$ 230,174
River Facility Repairs and Annual Maintenance:	$ 448,904
Designated Fund Balance Reserve	
• Local Flood Match Funds:	$ 11,000
• Pump Station Repair and Maintenance Funds:	$ 39,300
2003 Approved Budget:	**$ 993,920**

2003 GOALS

The 2003 goals for the Green River Flood Control Zone District include the following:

- Construct high priority river facility repair projects, and continue the annual maintenance and vegetation management program. Continue communication with the recreational river users on lower Green River projects and programs that may affect recreation.
- Maximize community volunteer participation to plant native riparian tree and shrub species at constructed river facility repair project sites.
- Provide operation and maintenance to the Green River pump stations to King County standards consistent with the Pump Operations Procedures Plan to ensure optimal operating conditions. Continue fish migration monitoring at Black River pump station.

- Conduct spring and fall river maintenance assessments and prioritize flood damage repair projects. Continue to monitor and evaluate river facilities unrepaired following the November 1995 and February 1996 flood events, including the remaining five unrepaired projects proposed for construction in the Lower Green River Biological Assessment.
- Staff 2003 Flood Patrols and complete River Facility Damage Assessments as needed during flood events and other disaster related events. Continue implementation of the Post-Flood Recovery Plan for the Lower Green River Basin and Lower Green River Flood Response Manual to enhance flood response and coordination between King County and the Green River cities.
- Work with the U.S. Army Corps of Engineers on operations of Howard Hanson Dam to coordinate and improve the level of downstream flood protection and limit the impacts on District maintained flood protection facilities.
- Support King County and the U.S. Army Corps of Engineers' Green-Duwamish Ecosystem Restoration Project efforts for proposed project affecting District's facilities.
- Complete annual reports for the Tukwila and Horseshoe Bend 205 Projects for the U.S. Army Corps of Engineers.
- Finalize the memorandum of understanding and agreement with King County's Department of Transportation to use a Green River Flood Control Zone District-owned parcel for a stream buffer enhancement project identified in the Wetland Mitigation Plan for the South 277th Street Reconstruction Phase III Project.
- Coordinate District activities with other WRIA 9 projects and programs on salmon recovery plans and measures in response to the Endangered Species Act.
- Continue monitoring and assessment program initiated in 2000 to provide greater baseline and post-construction habitat utilization data at proposed and completed project sites.
- Pursue further risk-based analyses to more accurately determine flooding potential and the expected average annual avoided damages in the District as a result of levee and revetment instability. The next phase will include collection of channel characterization data and base topographic maps by the Puget Sound LIDAR Consortium and developing a prioritized long-term levee and revetment repair, reconstruction and maintenance plan.
- Coordinate ongoing District Technical Committee and Executive Committee meetings.
- Complete the Green River Flood Control Zone District's 2002 Annual Report.
- Provide technical support to King County's Flood Hazard Reduction Services Section on its update to the county's comprehensive Flood Hazard Reduction Plan, implementation of King County's Community Rating System, development of a six-year Capital Improvement Plan, and other projects and programs as needed.
- Pursue grants and other means of revenue enhancements available to the District to enhance the District's capability to fund future repairs to critical flood protection facilities.

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